# DIET OF THE SMOOTH INDIAN OTTER (*LUTRA PERSPICILLATA*) AND OF FISH EATING BIRDS; A FIELD SURVEY[1]

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*(With six text-figures)*

A five month field study of the smooth Indian otter *(Lutra perspicillata)* was carried out, beginning mid October 1984. It took place within the Royal Chitwan National Park, which is situated in the belt of subtropical jungle of the terai, Southern Nepal. The seventy-five kilometre stretch of the Narayani River which runs within the Park was surveyed for otter spoor. A survey of the fish population was also carried out in order to identify the fish species present and their distribution. The results of the otter survey are reported here. A total of 172 spraints were collected and the faecal components analysed. The remains of fish, frog, crab, insect and small mammals were identified. The relative importance of the major dietary components was compared along the length of the river. In the southernmost sections surveyed fish were much more common in the diet, whereas further north frogs became increasingly more important.

By the comparison of distinctive fish remains with a reference collection compiled during the course of the fish survey, it was possible to identify to species level the remains of some fish. Of a total of seventy fish species captured during the course of the study, twenty-six were identified from pharyngeal teeth and dorsal spines recovered in faeces. Fish vertebrae were measured to give an index of prey size.

The regurgitated pellets produced by fish-eating birds were dissected to give an indication of fish species eaten and their size range, and to enable comparison between birds and otters. The data suggests birds predominantly predate small, shoal-living fish.

## INTRODUCTION

The smooth Indian otter is only found within southern Asia. A survey by Wayre (1971) has shown the species to be nearly extinct in Pakistan, becoming rare in Thailand, and only abundant in less populated areas of Malaysia. Its status elsewhere in Southern Asia is unknown. In Nepal, this species is known to exist in the Royal Chitwan National Park, and in the Karnali reserve in the West of Nepal (K.K. Gurung, personal communication). Within its range the smooth Indian otter inhabits both coastal and freshwaters, the latter being preferred, and is said to require for its territory approximately eight to ten kilometre stretches of river (Wayre 1974).

No detailed studies to date have been done on the diet of the smooth Indian otter in its natural habitat. Most dietary studies have been on species belonging to the genus *Lutra* but mainly on the common otter *(Lutra lutra)* and sea otter *(Enhydra lutras)*. Since otters are difficult to observe, most dietary studies have been done indirectly by faecal analysis.

This paper reports on the survey of this species distribution within the Royal Chitwan National Park, and on the results of faecal analysis.

## METHODS

Between mid October 1984 and the end of February 1985 the seventy-five kilometre stretch of the Narayani river within the Park was surveyed to assess the distribution of the smooth Indian otter. During the survey both river banks were searched on foot for spoor. The position of spraints was recorded as well as their size and association with habitat features. Subsequent to collection spraints were washed in a fine sieve and left to dry in the sun. They were then individually dissected and the various components separated. In some cases

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it was possible to identify from which fish species pharyngeal teeth and dorsal spines originated by comparison with a reference collection of identified, boned fish which was compiled during the course of the study.

A similar technique was used to determine the composition of regurgitated pellets left along the river bank by fish eating birds. This facilitated a comparison of the species taken by each group of fish predator.

Fish vertebrae found in otter spraints and bird pellets were measured along their anterior-posterior axis to give an indication of the size ranges of prey.

## RESULTS

**Spoor Distribution:** For the purpose of this study the Narayani was divided into eight sections (figure 1). Otter spoor were found along the entire length of the Narayani within the Park with two exceptions:

(i) in November no signs were found in regions one, two and three, but by January they were plentiful in these regions;

(ii) no signs were found in region eight.

Otter signs were found both on banks inside and outside the Park boundary although no holt or play sites were found in the cultivated area outside the Park boundary. Spraints were collected from one of two types of sprainting sites which differed in a number of respects:

(i) *single spraints*. These were found almost exclusively on prominant rocks, logs, or scraped up mounds. Single spraints could be as close as one and a half metres apart and tended to be situa-

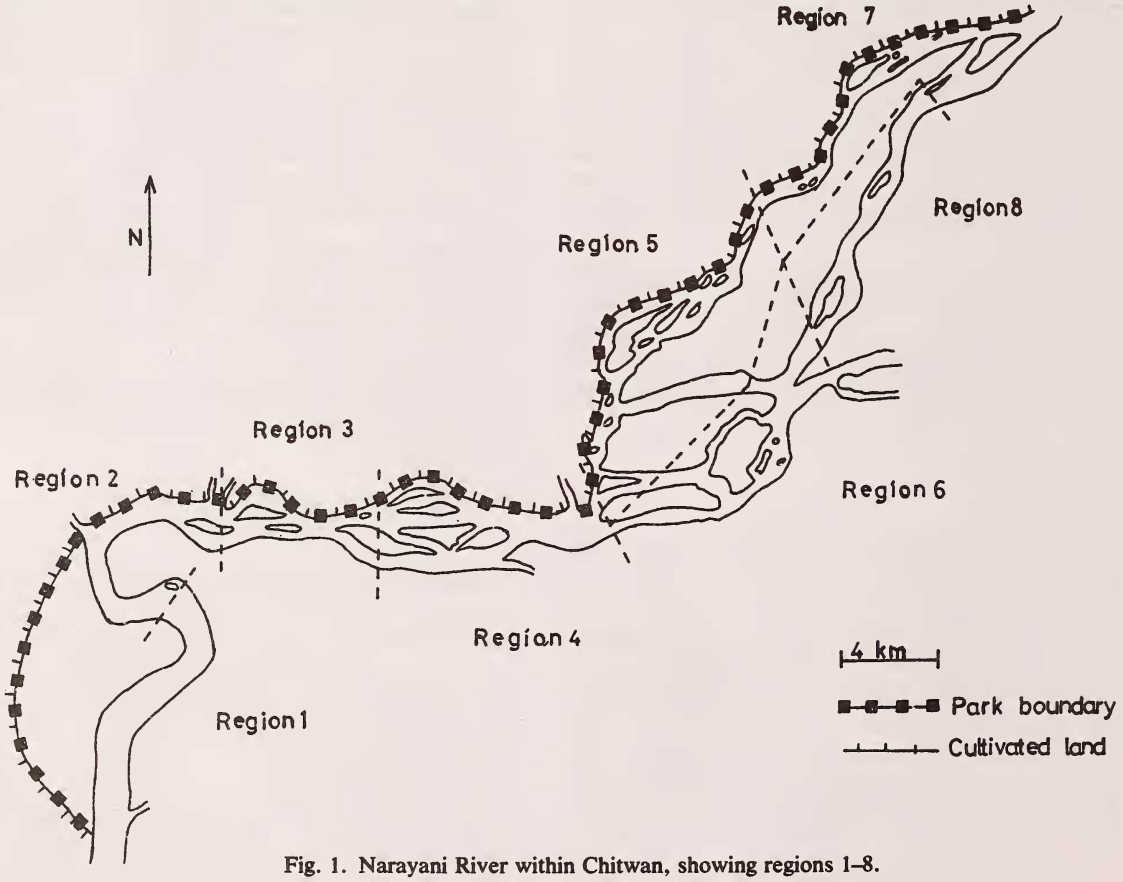


Fig. 1. Narayani River within Chitwan, showing regions 1–8.

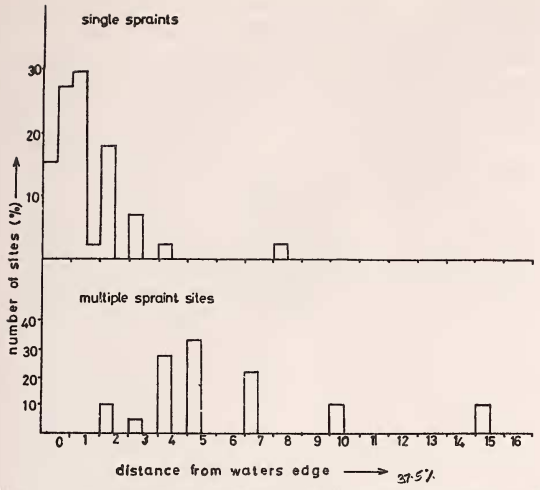


Fig. 2. Relationship between the two spraint types (single and multiple spraint sites) and distance from the river.

ted within three metres from the river's edge (figure 2).

(ii) *multiple spraints*. These were found on dry sandy banks or sand and shingle banks, sometimes marking river confluences. Larger sites were found at least fifty metres apart and in general were further from the water's edge (figure 2).

The sprainting behaviour of the smooth Indian otter is similar to that of other members of the genus *Lutra,* in particular to that of the common otter *(Lutra lutra)* in Britain.

**Spraint Analysis:** Within each of the regions one to eight the spraint data was summed and represented by the pie graphs in figure 3. Spraint components were fish, frog, shrimp, crab, insect, snake and small mammal. The proportions of the dietary components found in the faeces varied between regions. In the southernmost regions, one and two the predominant remains found in spraints were from fish (ninety-four per cent and seventy-six per cent respectively). Progressing north of region two frog bones were increasingly common in spraints, comprising as much as fifty-eight per cent in region seven. The remains of other prey such as crabs, shrimps, snakes and insects were also more common in spraints north of region two.

Twenty-six of the commonest fish species could be identified to species by examination of pharyngeal teeth and distinctive spines. Other workers have used various types of undigested fish remains for identification purposes. These include fish scales (Webb 1978), vertebrae (Wise 1980) and pharyngeal teeth.

As well as being identified, teeth were measured. For any spraint, if two sets of teeth from the same species were of the same size and from opposite sides of the head then it was assumed both originated from the same fish. Thus an estimate of the minimum number of fish occurring in a spraint was obtained.

Figure 4 shows the frequency with which each fish species was identified from spraints, and the minimum number of fish present in

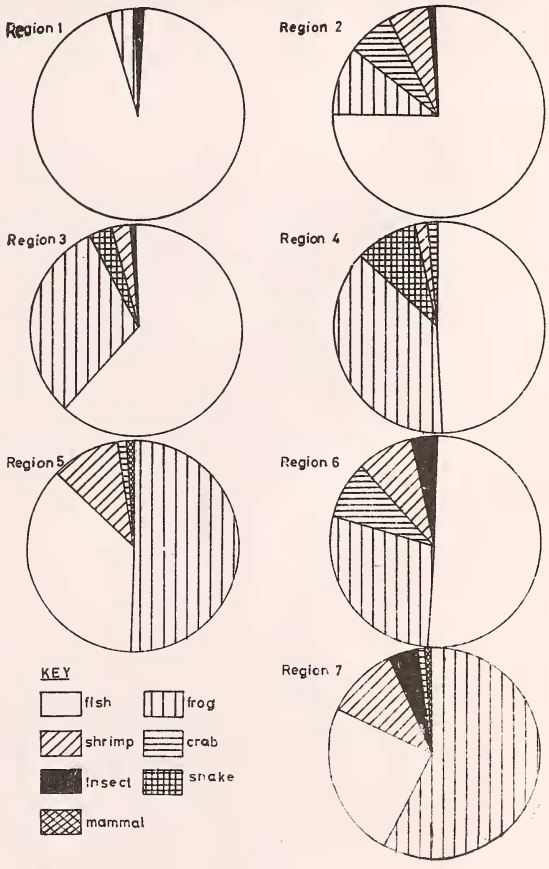


Fig. 3. Composition of the diet of the smooth Indian otter in regions 1-7 (no samples from region 8).

each spraint. The results for all regions is summed.

**Comparison with fish-eating birds:** The composition of regurgitated pellets deposited by fish-eating birds was examined in an attempt to assess which fish species were of most dietary importance. The most common species of fish eating birds in the Park are the large cormorant *(Phalacrocorax carbo)*, small pied kingfisher *(Ceryle rudis)*, Eurasian kingfisher *(Alcedo atthis)*, white breasted kingfisher *(Halcyon smyrnensis)*, night heron *(Nycticorax nycticorax)*, pond heron *(Ardeola grayii)*, intermediate egret *(Egretta alba)* and little egret *(Egretta garzetta)*.

Figure 5 shows the frequency with which teeth of each fish species were found in bird pellets. There is considerable overlap in the species taken by otters and birds, although the predominance of teeth from *Puntius* sp., *Barilus* sp., and *Danio devario* in bird pellets suggests a prediliction for small, shoal- living species.

To compare the size-ranges of fish captured by the two groups of predator, vertebrae found in spraints and pellets were measured along their anterior-posterior axis. It has been reported that there is a direct relationship between the size of the vertebrae and the size of the fish

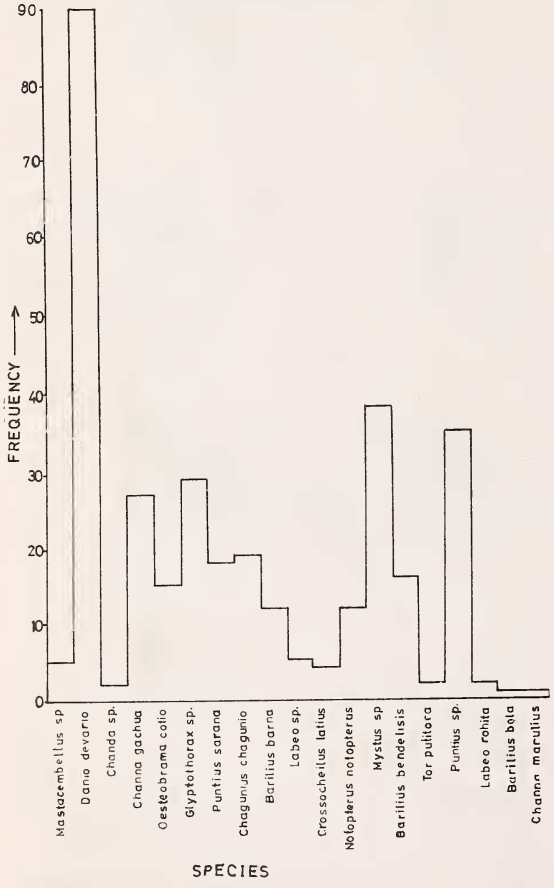


Fig. 4. Frequency with which teeth from each fish species were found in otter spraints.

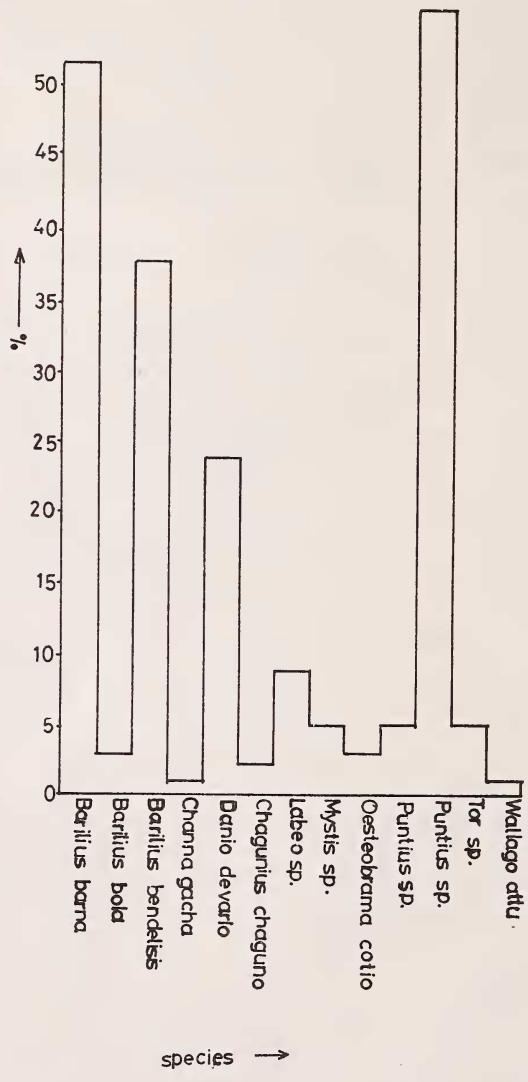


Fig. 5. Frequency with which teeth from each fish species were found in bird pellets.

(Wise 1980). The size ranges of vertebrae found in individual spraints and pellets are plotted in figure 6. Vertebrae found in bird pellets all lay within the range 0.25 - 2 mm, whereas those found in otter spraints ranged from 0.25 - 4.5 mm.

## Discussion

Dietary analysis from faecal component data is an indirect method. As such, the technique is prone to bias, some prey items, notably crustaceans, will have a higher proportion of hard:soft parts and so will be over-represented in the faeces.

Within the seventy-five kilometre stretch of the Narayani under study there is considerable variation in the composition of the otter's diet. In regions one and two the major constituent is fish, further north other components, notably frog, become more important. Dietary differences could be attributable to a number of factors. The river's topography varies, and this is likely to affect both the prey available and the most effective foraging methods. In regions one and two the river runs in a single channel and in many places the banks descend steeply into the water. North of region two the river is braided into a number of channels by islands. Here the river has sandy stretches where the water is slow flowing, and faster flowing regions with a stony river bed. Conditions in regions one and two are favourable for fish requiring a large, deep and slowly flowing body of water. Further north, fish which prefer shallow, fast-flowing water or sandy pools will be more common. Other potential prey species inhabiting the sandy pools include shrimp and freshwater crabs.

Human fishing activity is another factor li-

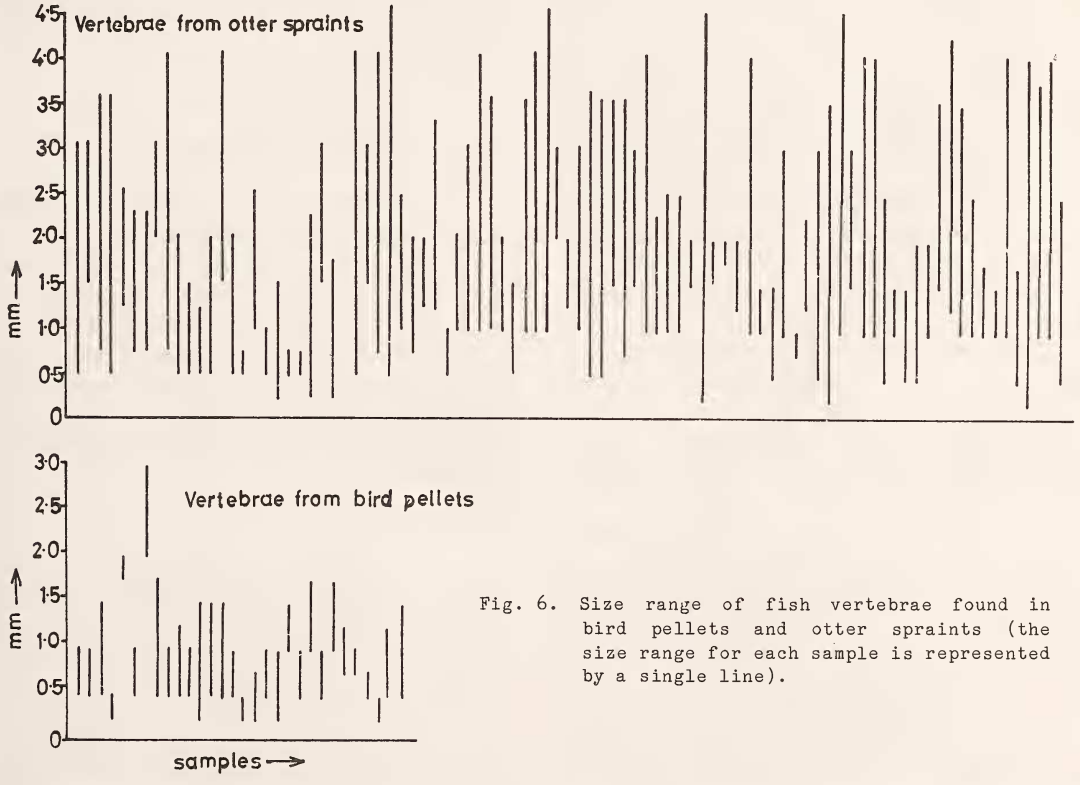


Fig. 6. Size range of fish vertebrae found in bird pellets and otter spraints (the size range for each sample is represented by a single line).

Fig. 6. Size range of fish vertebrae found in bird pellets and otter spraints (the size range for each sample is represented by a single line).

kely to influence the availability of prey. Fishing by local people occurs where the river forms the Park's boundary. This is the case north of region two. The Park authorities prohibit the use of methods particularly damaging to the fish population such as fish traps placed over small tributaries and the practice of damming and draining short sections of the river. However, both these methods which damage fish stocks by removing large numbers of immature fish are still in use in the Park.

Evidence both from local fishermen and our own fish survey (Evans *et al.* 1985) suggests that where there is human access to the river north of region two, stocks are over-fished. By comparison, stocks in regions one and two will not be subjected to overfishing for two reasons. Firstly, human access is restricted by the fact this stretch of the river is bordered on both sides by the National Park. Secondly, the fact the river is broad and deep prevents the use of fish traps and damming and draining methods.

Both the effects of the river's topography and of human fishing activity are consistent with our data, and it is difficult to assess the contribution of each. The considerable dietary variation shown in this study suggests otters are able to exploit a wide range of prey, a valuable attribute where fish stocks are low. However, other predators which rely more heavily on fish, for example the endangered species of crocodile, the gharial *(Gavialis gangeticus)* and the rare Gangetic dolphin *(Plantasia gangetica)* may be more seriously be affected by the results of overfishing.

The identification of fish remains to species level provides precise dietary information on prey items found in spraints. However, this data cannot be used to make inferences about species not positively identified in spraints. There are various reasons why distinctive bone fragments may not appear in the faeces. Particularly fragile teeth are more likely to break during passage through the gut. Distinctive fragments of fish which are not swallowed whole may not appear, for example, the head of *Xenatodon cancila* which is long, bony and full of teeth may not be swallowed. Species without distinctive skeletal features such as *Nemacheilus botia* and *Amblyceps mangois* will not be recognised in spraints.

The fish remains found in spraints suggest the otter predates a wide size range of fish from a variety of habitats. By comparison, bird pellets contained remains from species of fish which remain small throughout their life cycle. Data obtained from the measurement of vertebrae supported the conclusion that otters take a much wider size range of fish species than do fish- eating birds.

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